



STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION



PAUL R. LEPAGE
GOVERNOR

PATRICIA W. AHO
COMMISSIONER

**Madison Paper Industries
Somerset County
Madison, Maine
A-427-77-6-A**

**Departmental
Findings of Fact and Order
Air Emission License
NSR #6**

FINDINGS OF FACT

After review of the air emissions license amendment application, staff investigation reports and other documents in the applicant's file in the Bureau of Air Quality, pursuant to 38 Maine Revised Statutes Annotated (M.R.S.A.), §344 and §590, the Maine Department of Environmental Protection (Department) finds the following facts:

I. REGISTRATION

A. Introduction

FACILITY	Madison Paper Industries
LICENSE TYPE	06-096.CMR 115, Minor Modification
NAICS CODES	322121 Paper Mills
NATURE OF BUSINESS	Mechanical Pulp and Supercalendered Paper Production
FACILITY LOCATION	Madison, Maine

B. Amendment Description

Madison Paper Industries (Madison) has submitted a New Source Review (NSR) amendment application to reflect the addition of a generator to power a new wood slashing unit in the Groundwood Mill. The existing wood slashing unit is to be removed and replaced with the new unit.

C. Emission Equipment

The following equipment is addressed in this air emission license:

Generators

<u>Equipment</u>	<u>Power Output (kW)</u>	<u>Firing Rate (gal/hr)</u>	<u>Fuel Type, % sulfur</u>	<u>Install. Date</u>	<u>Stack No.</u>
Slashing Generator	1000	74.34	Diesel, 0.0015% S	2014	N/A

The new wood slashing unit is considered an insignificant activity per 06-096 CMR 115, Appendix B(A)(113); however the generator used to power it is not.

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1235 CENTRAL DRIVE, SKYWAY PARK
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D. Application Classification

A new emission unit at a major source is considered a major modification based on whether or not expected emission increases exceed the "Significant Emission Increase Levels" as defined in the Department's regulations. The emissions increases for a new source are determined by the maximum future license allowed emissions, as follows:

<u>Pollutant</u>	<u>Net Change (TPY)</u>	<u>Sig. Level</u>
PM	0.9	25
PM ₁₀	0.9	15
PM _{2.5}	0.9	10
SO ₂	0.1	40
NO _x	20	40
CO	15.4	100
VOC	0.2	40
CO ₂ e	< 75,000	75,000

Notes: The net change in tons per year emissions were based on the proposed fuel cap of 297,360 gallons per year of ultra-low sulfur diesel fuel for all pollutants except NO_x. Emissions from NO_x are limited to 20 TPY.

Therefore, this amendment is determined to be a minor modification under *Minor and Major Source Air Emission License Regulations* 06-096 CMR 115 (as amended). Since all emissions associated with this modification will increase, all criteria pollutants are subject to Best Available Control Technology (BACT) requirements.

II. **BEST PRACTICAL TREATMENT (BPT)**

A. Introduction

In order to receive a license, the applicant must control emissions from each unit to a level considered by the Department to represent Best Practical Treatment (BPT), as defined in *Definitions Regulation*, 06-096 CMR 100 (as amended). Separate control requirement categories exist for new and existing equipment as well as for those sources located in designated non-attainment areas.

BPT for new sources and modifications requires a demonstration that emissions are receiving Best Available Control Technology (BACT), as defined in *Definitions Regulation*, 06-096 CMR 100 (as amended). BACT is a top-down approach to selecting air emission controls considering economic, environmental and energy impacts.

B. Amendment Description

Madison Paper Industries is in the process of updating the wood slashing unit in the Groundwood Mill. The existing wood slashing unit and its associated power source is to be removed and replaced by a new unit manufactured by Caterpillar. Due to the new wood slashing unit being a first prototype, Madison does not have the ability to accurately estimate the slashing unit's power demands. The proposed Slashing Generator is to power the new wood slashing unit while the facility collects data to determine the power consumption of the new unit. Once enough data has been collected and analyzed, Madison will determine whether it is more economical to continue to utilize the Slashing Generator to provide power or to connect the new wood slashing unit to the electricity grid. Madison has requested to license the Slashing Generator permanently in case it is determined to be the more economical option and because the facility cannot afford to turn off the generator and shut down the slashing process during the time required by the permitting process to make the generator permanent; Madison will need to continue operating the wood slashing unit to meet production demands, and the old wood slashing unit and its power source are to be removed upon the arrival of the new wood slashing unit.

Madison has proposed to limit the Slashing Generator to 297,360 gallons per year of diesel fuel (equivalent to 4,000 hours per year) based on a 12-month rolling total. The fuel limit is large enough to cover the current operating production of the existing wood slashing unit plus additional fuel to allow for any production increase or uncertainties associated with the new wood slashing unit.

If Madison determines it is more economical to connect the new wood slashing unit to the electricity grid, the facility will notify the Department and submit an application to remove the Slashing Generator from the license.

C. Slashing Generator

Madison has requested the addition of a Caterpillar C32 non-emergency generator to power a new wood slashing unit at the Groundwood Mill, to be designated the Slashing Generator. The Slashing Generator is rated at 10.2 MMBtu/hour (1000 kW power output) and fires diesel fuel. The generator was manufactured in 2006 and is to be installed in May of 2014.

Madison submitted a BACT analysis for the criteria pollutants from the generator.

1. BACT Findings

The information on the economic impact, technical feasibility, and environmental impact of various control options was used to determine the best available control technologies and corresponding levels of control for the Slashing Generator. The following summarizes the BACT findings for the Slashing Generator.

PM/PM₁₀/PM_{2.5} – Particulate matter (PM) from fuel combustion is formed from non-combustible material (ash) in the fuel and from incomplete combustion of the fuel. Due to the fuel limit proposed by Madison which results in the maximum annual emissions being less than 1.0 ton per year, the installation of any add-on pollution control equipment is not cost effective even if the controls were technically feasible.

The combustion of clean fuels to minimize PM emissions is accomplished by burning diesel fuel with a minimal sulfur content. The combustion of ultra-low sulfur diesel fuel is technically feasible to minimize PM emissions and has been selected as part of the BACT strategy for the Slashing Generator.

BACT for PM/PM₁₀/PM_{2.5} emissions from the Slashing Generator is the combustion of ultra-low sulfur diesel fuel, not exceeding the fuel limit of 297,360 gallons of diesel fuel based on a 12-month rolling total, and proper operation and maintenance of the generator according to the manufacturer.

SO₂ – Sulfur dioxide (SO₂) is formed from the combustion of sulfur present in the fuel. Therefore, the most effective control option for SO₂ emissions is restricting the sulfur content of the diesel fuel. Any add-on control technologies for the control of SO₂ emissions are not economically feasible due to SO₂ not being a primary pollutant emitted from engines and the fact that with the fuel limit proposed by Madison the maximum annual emissions are less than 1.0 ton per year.

The Slashing Generator fires ultra-low diesel fuel which is inherently a low sulfur fuel with only trace amounts of sulfur available to combine with oxygen in the combustion process. The use of ultra-low sulfur diesel fuel has been determined to be BACT for SO₂ emissions from the Slashing Generator, as well as not exceeding the fuel limit of 297,360 gallons of diesel fuel based on a 12-month rolling total, and proper operation and maintenance of the generator according to the manufacturer.

NO_x – Nitrogen oxides (NO_x) from internal combustion engines is generated primarily from thermal NO_x but with trace amounts from fuel NO_x and prompt NO_x. Oxidation of hydrocarbon radicals near the combustion flame forms prompt NO_x in insignificant amounts. Reducing NO_x formation from the thermal NO_x includes maintaining combustion temperatures below 3600°F because it is formed in the high-temperature region of the flame from dissociated molecular nitrogen in the combustion air. Potential control technologies for NO_x emissions include add-on controls, such as selective catalytic reduction (SCR) and nonselective catalytic reduction (NSCR), and modifying the combustion processes, including using control techniques such as derating and injection timing retard (ITR).

Selective Catalytic Reduction (SCR) involves the injection of ammonia (NH_3) into the flue gas in the presence of a catalyst. The catalyst allows the ammonia to react with NO_x to form water and nitrogen. SCR can result in NO_x reductions up to 90%. However, the effectiveness of SCR is dependent on the fuel quality and load fluctuations of the engine. The Slashing Generator will be operating to provide power to a wood slashing unit which cuts logs of varying sizes and densities. The demand of power from the wood slashing unit, provided by the Slashing Generator, will vary dramatically. The engine may be at or near idle status between logs, and then suddenly increase to maximum power in a matter of seconds when cutting a log, and then fall back to idle almost as quickly. With such ongoing, large swings in engine load, SCR is not technically feasible. In addition, the estimated capital cost to install SCR is approximately \$250,000 (\$250 per kW for a 1,000 kW engine), which does not include annual expenses for operation and maintenance. The original cost of the Caterpillar engine itself is \$300,000. Thereby, it is not economically feasible to install SCR where such a device would almost equal the cost of the emission unit itself.

Nonselective Catalytic Reduction (NSCR) involves placing a catalyst into the engine exhaust stream which then works to simultaneously reduce NO_x , carbon monoxide (CO), and hydrocarbons (HC). The reaction between the catalyst and the exhaust stream requires that the oxygen levels be kept low and that the engine be operated at a rich air-to-fuel ratio. The Slashing Generator is a lean burn engine, which is characterized by medium to high levels of oxygen in the exhaust, thus it is not technically feasible to apply NSCR.

Modifying the combustion process to lower NO_x formation rates by derating involves restricting the engine operation to lower than normal levels of power production for the given application by reducing the engine's cylinder pressures and temperatures. Madison anticipates that the Slashing Generator will need to operate at, or close to, maximum design output to provide the new wood slashing unit with enough power to sufficiently handle large and dense logs. Therefore, derating is not a technically feasible combustion process for the Slashing Generator.

For compression ignition (diesel fuel fired) engines, the combustion process is initiated once fuel is injected into the cylinder of the engine. The combustion process may be modified by retarding the timing of the diesel fuel injection, which causes the combustion to occur later in the power stroke when the piston is in the downward motion and combustion chamber volume is increasing. When this is done, NO_x formation is lowered due to the lowered combustion temperature and pressures resulting from the increased volume. The amount of NO_x reduction with injection timing retard (ITR) diminishes with increasing levels of retard and is specific to each engine. Due to the intended operation of the Slashing Generator to perform at maximum design output and the unknowns

of the new wood slashing unit, ITR is not technically feasible at this time while Madison is determining the full usage extent of the engine.

Therefore, there are no add-on control technologies or combustion process modification techniques that meet BACT at this time. BACT for the control of NO_x emissions from the Slashing Generator is limiting the NO_x emissions to 20 tons per year, and proper operation and maintenance of the generator according to the manufacturer.

However, due to the nature of the initial operating scenario being a trial run and the fact that Madison Paper Industries has the option to continue to power the wood slashing unit by the generator upon analysis of information collected, the Department has determined that if Madison determines that the Slashing Generator will be the most economical means to power the new wood slashing unit, the facility shall install controls on the generator to meet BACT. Madison shall install control equipment to achieve 50% reduction in NO_x emissions on or before October 31, 2014, if it is determined that the facility will continue to operate the Slashing Generator. Madison shall test to demonstrate compliance with the 50% reduction in NO_x emissions within 180 days of the installation date of the controls.

CO – Carbon monoxide (CO) can result from incomplete combustion caused by conditions such as insufficient resident time in the cylinder, if the gas temperature is too low or limited oxygen availability during combustion. Due to the fuel limit proposed by Madison resulting in the maximum annual emissions being less than 3.0 tons per year, the installation of any add-on pollution control equipment is not technically or economically feasible.

BACT for CO emissions from the Slashing Generator is the combustion of ultra-low sulfur diesel fuel, not exceeding the fuel limit of 297,360 gallons of diesel fuel based on a 12-month rolling total, and proper operation and maintenance of the generator according to the manufacturer.

VOC – Volatile organic compounds (VOCs) can result from incomplete mixing before or during combustion caused by conditions such as incorrect air/fuel ratios, excessively large fuel droplets, or low cylinder temperatures. Due to the fuel limit proposed by Madison resulting in the maximum annual emissions being less than 1.0 ton per year, the installation of any add-on pollution control equipment is not technically or economically feasible.

BACT for VOC emissions from the Slashing Generator is the combustion of ultra-low sulfur diesel fuel, not exceeding the fuel limit of 297,360 gallons of diesel fuel based on a 12-month rolling total, and proper operation and maintenance of the generator according to the manufacturer.

Based on the BACT review, the emission limits for the Slashing Generator are based on the following emission factors:

PM/PM ₁₀ /PM _{2.5}	- 0.2 g/kW-hr based on 40 CFR Part 89, §89.112
SO ₂	- Combustion of diesel fuel with a maximum sulfur content not to exceed 15 ppm (0.0015% sulfur)
NO _x	- 19.33 lb/hr based on manufacturer emissions data (Caterpillar Gen Set Package Performance Data, dated May 9, 2014)
CO	- 3.5 g/kW-hr based on 40 CFR Part 89, §89.112
VOC	- 0.08 lb/hr based on manufacturer emissions data (Caterpillar Gen Set Package Performance Data, dated May 9, 2014)
Opacity	- 06-096 CMR 101

The BACT emission limits for the generator are the following:

Unit	PM (lb/hr)	PM ₁₀ (lb/hr)	PM _{2.5} (lb/hr)	SO ₂ (lb/hr)	NO _x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
Slashing Generator	0.44	0.44	0.44	0.02	19.33	7.72	0.08

Visible emissions from the Slashing Generator shall not exceed 20% opacity on a 6-minute block average, except for no more than two (2) six (6) minute block averages in a 3-hour period.

Madison shall be limited to a 297,360 gallons per year of diesel fuel (equivalent to 4,000 hours per year) based on a 12-month rolling total.

2. Periodic Monitoring

Periodic monitoring for the generator shall include recordkeeping to document fuel use both on a monthly and 12-month rolling total basis. Documentation shall include the quantity and type of fuel used, and the sulfur content of the fuel.

3. New Source Performance Standards (NSPS)

The federal regulation 40 CFR Part 60, Subpart IIII, *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (CI ICE)* is applicable to the Slashing Generator since the unit was ordered after July 11, 2005 and manufactured after April 1, 2006. [40 CFR, Part 60, §60.4200(a)(2)]

- a. 40 CFR Part 60, Subpart IIII Emission Standards:

The generator shall comply with the following standards:

<u>Max. Engine Power</u>	<u>PM</u> <u>(g/kW-hr)</u>	<u>NO_x</u> <u>(g/kW-hr)</u>	<u>CO</u> <u>(g/kW-hr)</u>	<u>HC</u> <u>(g/kW-hr)</u>
kW > 560	1.3	9.2	11.4	0.54

[40 CFR §60.4204(a) and 40 CFR Part 60, Subpart IIII, Table 1]

- b. 40 CFR Part 60, Subpart IIII Requirements:

(1) Manufacturer Certification Requirement

The generator shall be certified by the manufacturer as meeting the emission standards found in 40 CFR Part 60, Subpart IIII, Table 1 and 40 CFR Part 89. Madison shall keep records of the engine manufacturer data indicating compliance with the standards. [40 CFR §60.4205(b)]

(2) Ultra-Low Sulfur Diesel Fuel Requirement

The diesel fuel fired in the generator shall not exceed 15 ppm sulfur (0.0015% sulfur), except that any existing diesel fuel purchased (or otherwise obtained) prior to October 1, 2010, may be used until depleted. [40 CFR §60.4207(b)]

(3) Operation and Maintenance Requirements

The generator shall be operated and maintained according to the manufacturer's emission-related written instructions or procedures developed by Madison that are approved by the engine manufacturer. Madison may only change those emission-related settings that are permitted by the manufacturer. [40 CFR §60.4211(a)]

4. National Emission Standards for Hazardous Air Pollutants (NESHAP)

By meeting the requirements of 40 CFR Part 60, Subpart IIII, the Slashing Generator also meets the applicable requirements found in the *National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*, 40 CFR Part 63, Subpart ZZZZ. [40 CFR, Part 63, §63.6590(c)(1)]

D. Annual Emissions

1. Total Annual Emissions

Madison shall be restricted to the following annual emissions, based on a 12-month rolling total. The tons per year limits for the Boilers, Groundwood Process, and

Temporary Package Boiler did not change due to this NSR amendment and shall remain the same as previously licensed. The tons per year limits for the Slashing Generator were calculated based on 297,360 gallons per year of diesel fuel for all pollutants except NO_x; the annual emissions from NO_x are limited to 20 tons per year following the installation of controls to achieve a 50% reduction in uncontrolled NO_x emissions.

Total Licensed Annual Emissions for the Facility
Tons/year
(used to calculate the annual license fee)

EMISSION UNIT	PM	PM ₁₀	SO ₂	NO _x	CO	VOC
Boilers 4, 6, and 7	135	135	1276	371	100	8
Groundwood Process	-	-	-	-	-	39
Temporary Package Boiler	2	2	23	5	4	0.2
Slashing Generator	0.9	0.9	0.1	20	15.4	0.2
Total TPY	138	138	1299	396	119	47

III.AMBIENT AIR QUALITY ANALYSIS

In accordance with 06-096 CMR 115, the level of ambient air quality impact modeling required for a minor modification to a major source which has the potential to emit regulated pollutants at a rate greater than the emission levels in the following table and has an air quality analysis incorporated into its existing air emission license shall be determined on a case-by-case basis with consideration for air quality data, Good Engineering Practice stack height, similarity with other license sources, location and the results of previous air quality analyses.

<u>Pollutant</u>	<u>Tons/Year</u>
PM ₁₀	25
SO ₂	50
NO _x	50
CO	250

The total facility licensed emissions at Madison are above the emission levels contained in the table above and therefore, an ambient air quality impact analysis is required as part of this license. However, due to the nature of the initial operating scenario being a trial run, and the possibility that the generator may only run for limited months before being removed from operation, the Department has determined that modeling shall only be required should Madison determine that the Slashing Generator will be the most economical means to power the new wood slashing unit. If it is determined that the facility will continue to operate the Slashing Generator, Madison shall submit ambient air quality impact modeling that demonstrates compliance on or before October 31, 2014.

ORDER

Based on the above Findings and subject to conditions listed below, the Department concludes that the emissions from this source:

- will receive Best Practical Treatment,
- will not violate applicable emission standards, and
- will not violate applicable ambient air quality standards in conjunction with emissions from other sources.

The Department hereby grants Air Emission License A-427-77-6-A pursuant to the preconstruction licensing requirements of 06-096 CMR 115 and subject to the special conditions below.

Severability. The invalidity or unenforceability of any provision, or part thereof, of this License shall not affect the remainder of the provision or any other provisions. This License shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.

SPECIFIC CONDITIONS

(1) Slashing Generator

A. Fuel

1. Total fuel fired in the Slashing Generator shall not exceed 297,360 gallons per year of diesel fuel based on a 12-month rolling total. [06-096 CMR 115, BACT]
2. Compliance shall be demonstrated by fuel records from the supplier showing the quantity, type, and the percent sulfur of the fuel delivered. Records of annual fuel use shall be kept on a monthly and 12-month rolling total basis. [06-096 CMR 115, BACT]

B. Emissions shall not exceed the following [06-096 CMR 115, BACT]:

Unit	PM (lb/hr)	PM ₁₀ (lb/hr)	PM _{2.5} (lb/hr)	SO ₂ (lb/hr)	NO _x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
Slashing Generator	0.44	0.44	0.44	0.02	19.33	7.72	0.08

- C. Visible Emissions shall each not exceed 20% opacity on a six (6) minute block average, except for no more than two (2) six (6) minute block averages in a continuous 3-hour period. [06-096 CMR 101]

- D. Madison shall not exceed 20 tons per year of NO_x emissions based on a 12-month rolling total. [06-096 CMR 115, BACT]
- E. The Slashing Generator shall meet the applicable requirements of 40 CFR Part 60, Subpart IIII, including the following:
1. The generator shall comply with the following standards:

<u>Max. Engine Power</u>	<u>PM</u> <u>(g/kW-hr)</u>	<u>NO_x</u> <u>(g/kW-hr)</u>	<u>CO</u> <u>(g/kW-hr)</u>	<u>HC</u> <u>(g/kW-hr)</u>
kW > 560	1.3	9.2	11.4	0.54

[40 CFR §60.4204(a) and 40 CFR Part 60, Subpart IIII, Table 1]

2. Manufacturer Certification Requirement

The generator shall be certified by the manufacturer as meeting the emission standards found in 40 CFR Part 60, Subpart IIII, Table 1 and 40 CFR Part 89. Madison shall keep records of the engine manufacturer data indicating compliance with the standards. [40 CFR §60.4205(b)]

3. Ultra-Low Sulfur Diesel Fuel Requirement

The diesel fuel fired in the generator shall not exceed 15 ppm sulfur (0.0015% sulfur), except that any existing diesel fuel purchased (or otherwise obtained) prior to October 1, 2010, may be used until depleted. [40 CFR §60.4207(b)]

4. Operation and Maintenance Requirements

The generator shall be operated and maintained according to the manufacturer's emission-related written instructions or procedures developed by Madison that are approved by the engine manufacturer. Madison may only change those emission-related settings that are permitted by the manufacturer. [40 CFR §60.4211(a)]

- F. Madison shall submit written notification to the Department on the determination of the decision on how the facility will power the new wood slashing unit at the completion of a trial run. If the decision is made to continue operating the Slashing Generator, Madison shall comply with the following:

1. Madison shall submit ambient air quality impact modeling that demonstrates compliance on or before October 31, 2014.
2. Madison shall install NO_x controls on the Slashing Generator on or before October 31, 2014 to achieve a 50% reduction in NO_x emissions. Madison shall test to demonstrate compliance with the NO_x reduction within 180 days of the installation of the control equipment.

Madison Paper Industries
Somerset County
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- (2) Madison shall submit an application to incorporate this NSR amendment into the Part 70 air emission license within 12 months of commencing operations under the proposed scenario as provided in 40 CFR Part 70.5. [06-096 CMR 140, Section 1(C)(8)]

DONE AND DATED IN AUGUSTA, MAINE THIS 3 DAY OF June, 2014.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: Mauro Allen Robert Core for
PATRICIA W. AHO, COMMISSIONER

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of initial receipt of application: 05/09/2014

Date of application acceptance: 05/12/2014

Date filed with the Board of Environmental Protection:

This Order prepared by Allison M. Hazard, Bureau of Air Quality.

